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Evidence for a binary origin of a central compact object

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Abstract

© 2016 The Authors.Central compact objects (CCOs) are thought to be young thermally emitting isolated neutron stars that were born during the preceding core-collapse supernova explosion. Here, we present evidence that at least in one case the CCO could have been formed within a binary system. We show that the highly reddened optical source IRAS 17287-3443, located 25 arcsec away from the CCO candidate XMMUJ173203.3-344518 and classified previously as a post asymptotic giant branch star, is indeed surrounded by a dust shell. This shell is heated by the central star to temperatures of ~90 K and observed as extended infrared emission in 8-160 μm band. The dust temperature also increases in the vicinity of the CCO which implies that it likely resides within the shell. We estimate the total dust mass to be ~0.4-1.5 M⊙ which significantly exceeds expected dust yields by normal stars and thus likely condensed from supernova ejecta. Taking into account that both the age of the supernova remnant and the duration of active mass-loss phase by the optical star are much shorter than the total lifetime of either object, the supernova and the onset of the active mass-loss phase of the companion have likely occurred approximately simultaneously. This is most easily explained if the evolution of both objects is interconnected. We conclude, therefore, that both stars were likely members of the same binary system disrupted by a supernova.

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Keywords

Binaries: General, ISM: Supernova remnants, Stars: AGB and post-AGB, Stars: Formation, Stars: Neutron